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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/990,884

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Scott Patrick Campbell

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EXAMINER

BOUSIKARIS, LEONIDAS

ART UNIT

PAPER NUMBER

2872

DATE MAILED: 03/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.
09/990,884

Applicant(s)

Campbell

Examiner

Leo Boutsikaris

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Nov 21, 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above, claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 14, 15, 17, and 18 is/are allowed.
- 6) ☒ Claim(s) 1-3 and 5-13 is/are rejected.
- 7) ☒ Claim(s) 4 and 16 is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
*See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____ 6) ☐ Other:

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DETAILED ACTION

Claim Objections

1. Claim 16 is objected to because of the following informalities: "first" in line 4 should be replaced by "second optical mask layer". Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-3, 5-8, 10, 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakashiba (US 6,081,018) in view of Grinberg (US 5,764,389).

Regarding claims 1, 10, Nakashiba discloses an image sensor device comprising (Fig. 2, line 41, col. 4 to line 16, col. 5):

a substrate 1 of semiconductor material;

an array of sensing pixels 11 fabricated over the substrate, each pixel comprising a photoelectric conversion section to produce a pixel output representative of received radiation by the pixel; and

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optical mask layers comprising color filters 21-23 and micro-lenses 24 formed over the substrate in the optical path of the input radiation, said optical elements modifying a property (e.g. wavelength or intensity profile) of the input radiation prior to detection from the sensing pixels.

However, Nakashiba does not teach that the above optical filters and lenses comprise holographic elements. Grinberg discloses a display device (Fig. 1 and line 3, col. 5 to line 20, col. 6) wherein an array of holographic color filters 7 and an array of holographic microlenses 8 is used to filter and focus, respectively, incident radiation onto LCD pixels 22. It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the optical filter and microlens arrays in Nakashiba's image sensor device in the form of holographic elements, as taught by Grinberg, since holographic elements offer several advantages compared to conventional optical elements. For example, whereas conventional absorption color filters absorb all the light incident thereupon except light having a narrow wavelength range, thus causing significant throughput loss in the system, holographic color filters are designed to filter/diffract the desired wavelength range and transmit without any absorption all the other wavelengths. Furthermore, holographic lens elements can be designed to focus/direct the light incident thereupon towards several, spatially distant points, such as pixels, as opposed to conventional refractive microlenses.

Regarding claim 2, the sensing pixels are formed of multiple pixel layers such as layers 10, 7, 17, 16, 15, 14, 13 fabricated on the substrate 1 (see Fig. 2) and optical mask layer 24 is formed atop of said multiple pixel layers.

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Regarding claim 3, sensing pixels are formed of the multiple pixel layers cited supra fabricated on the substrate 1 and wherein optical mask layer 23 is between said multiple layers and the substrate (see Fig. 2).

Regarding claims 5-6, each holographic element in the device of Nakashiba in view of Grinberg either focuses input radiation to a corresponding sensing pixel underneath said holographic element or selectively separates one color in the input radiation from another color in the input radiation.

Regarding claim 7, each sensing pixel has an active photoelectric conversion region as well as in-pixel circuit elements such as charge transfer section 13 to convert the radiation induced charge into current or voltage.

Regarding claim 8, each optical filtering element 21-23 or focusing element 24 spatially covers only one sensing pixel (see Fig. 2).

Regarding claim 13, each holographic element disclosed by Grinberg is a diffractive element (line 25, col. 5).

4. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakashiba in view of Grinberg and further in view of Clarke (US 6,057,538).

Nakashiba in view of Grinberg discloses all the limitations of the above claim except for showing that each optical holographic element spatially covers at least two adjacent sensing pixels. Clarke discloses an image sensor device (Fig. 1) comprising an array of microlenses 32 to focus light onto sensing pixel(s) 22 (lines 48-65, col. 3). Each microlens element spatially covers

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(see Fig. 1) and is associated with a group of multiple e.g., nine pixels. It would have been obvious to one of ordinary skill in the art at the time the invention was made to fabricate the holographic elements in the image sensor device of Nakashiba in view of Grinberg so that each holographic element spatially covers more than one sensing pixels, as taught by Clarke, since in this way the fabrication of the microlens array becomes less complicated because the pitch between elements increases (see lines 60-61, col. 3 in Clarke).

5. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakashiba in view of Grinberg and further in view of Gambogi (US 6,081,354).

Nakashiba in view of Grinberg discloses all the limitations of the above claim except for showing that each optical holographic element is optically reflective. Gambogi discloses an image display device comprising LCD pixels 126 wherein holographic pixel elements 100 are used in a reflective configuration to reflect and direct light onto the LCD pixels (Fig. 1 and line 62, col. 4 to line 19, col. 5). It would have been obvious to one of ordinary skill in the art at the time the invention was made to fabricate the holographic elements in the image sensor device of Nakashiba in view of Grinberg so that they operate in a reflective mode with respect to the sensing pixels, as taught by Nakashiba, since a reflective display device may be used in conjunction with ambient light to provide a visible display on a colored background (lines 31-55, col. 1 in Gambogi).

6. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakashiba in view of Grinberg and further in view of McLeod (US 6,020,985).

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Nakashiba in view of Grinberg discloses all the limitations of the above claim except for showing that each optical holographic element is an absorption hologram. McLeod discloses holographic means for data storage (see Abstract) and he teaches that holograms may be formed either as phase holograms (information encoded in terms of local refractive index changes) or as absorption holograms (information is encoded in terms of local absorption within the medium changes, see lines 7-19, col. 7). It would have been obvious to one of ordinary skill in the art at the time the invention was made to fabricate the holographic elements in the image sensor device of Nakashiba in view of Grinberg in the form of absorption holograms, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for its intended use. *In re Leshin*, 125 USPQ 416. Absorption holograms, such as silver halide holograms, are the most commonly used and cheaper holograms with excellent properties in the low-diffraction efficiency region.

Allowable Subject Matter

7. Claim 4 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
8. Claims 14-15, 17-18 are allowed.
9. Claims 4, 14-18 are allowed over the prior art for at least the reason that the prior art fails to teach or reasonably suggest, regarding claim 4, a device wherein the optical mask layer is

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formed between the first and second set of contiguous pixel layers, and regarding claims 14-18, a device wherein the second optical mask layer is separated from the first optical mask layer by a set of contiguous pixel layers, as set forth by the claimed combination.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Li (US 2001/0050737 A1) discloses a display device (Fig. 1A) wherein a microlens array 108-116 formed on a planarization layer 120, and a color filter array 124-132 formed in a layer 152 are positioned on top of a sensor array 136-144 formed in a layer 148, see [0002], [0003].

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Leo Boutsikaris whose telephone number is (703) 306-5730.

Leo Boutsikaris, Ph.D.

March 2, 2003

JOHN JUBA
John Juba
PRIMARY EXAMINER
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